

WHAT IS CLAIMED IS:

1. An information-processing apparatus comprising:
 - a nonvolatile memory device configured to store firmware;
- 5 first means for issuing an instruction to an operating system to make the operating system execute a shutdown process, and to update the firmware, stored in the nonvolatile memory device, after the operating system has completed the shutdown process; and
- 10 second means, responsive to the instruction to update the firmware, for updating the firmware after the operating system has completed the shutdown process.
2. The information-processing apparatus according to claim 1, wherein the first means includes means for issuing, to the operating system, a shutdown request containing a request for updating the firmware, thereby making the operating system issue the instruction to update the firmware after the operating system has completed the shutdown process.
- 15 20 3. The information-processing apparatus according to claim 2, wherein:
 - the instruction to update the firmware supplied from the operating system is included in a power management event, which is issued from the operating system to power off or reboot the information-processing apparatus; and

TODAY'S PAPER

the second means includes means for powering off or rebooting the information-processing apparatus in response to the power management event, after the firmware has been updated.

5. 4. The information-processing apparatus according to claim 2, wherein;

the shutdown request issuing means includes means for reporting, to the operating system, first address information indicative of a storage location of new firmware to be written into the nonvolatile memory device; and

10 the second means includes means for reading the new firmware from a storage location indicated by second address information that is included in the instruction to update the firmware supplied from the operating system, and writing the read new firmware into the nonvolatile memory device.

15 5. The information-processing apparatus according to claim 4, wherein;

20 the first address information reported to the operating system corresponds to a logical memory address; and

25 the second address information included in the instruction to update the firmware supplied from the operating system corresponds to a physical memory address.

6. The information-processing apparatus according to

claim 2, wherein;

the shutdown request issuing means includes means for reporting, to the operating system, first address information indicative of a storage location of an updating information package that contains new firmware to be written into the nonvolatile memory device and an updating-process program used to write the new firmware into the nonvolatile memory device; and

the second means includes means for calling for the updating-process program contained in the updating information package stored in a storage location that is indicated by second address information included in the instruction to update the firmware supplied from the operating system, thereby causing the updating-process program to execute an updating process for writing the new firmware of the updating information package into the nonvolatile memory device.

7. The information-processing apparatus according to claim 6, wherein;

the first address information reported to the operating system corresponds to a logical memory address; and

the second address information included in the instruction to update the firmware supplied from the operating system corresponds to a physical memory address.

8. The information-processing apparatus according to

claim 1, wherein the firmware stored in the nonvolatile memory device is a BIOS program configured to control hardware of the information-processing apparatus.

9. The information-processing apparatus according to
5 claim 1, wherein the firmware stored in the nonvolatile
memory device is a program to be executed by an MPU in
a controller that is incorporated in the information-
processing apparatus.

10. An information-processing apparatus capable of
executing various types of programs, comprising:

a nonvolatile memory device configured to store firmware;

first means for issuing, to an operating system,
a shutdown request containing a request for updating
the firmware, thereby making the operating system
execute a shutdown process, and also causing the
operating system to issue, after the operating system
has completed the shutdown process, a power management
event including an instruction to update the firmware
stored in the nonvolatile memory device and to power
off or reboot the information-processing apparatus; and

second means, responsive to the power management event issued from the operating system, for executing a firmware-updating process to update the firmware stored in the nonvolatile memory device thereby providing new firmware, and then powering off or rebooting the information-processing apparatus.

11. The information-processing apparatus according to
claim 10, wherein;

the first means includes means for reporting,
to the operating system, first address information
5 indicative of a storage location of new firmware to be
written into the nonvolatile memory device; and

the second means includes means for reading new
firmware from a storage location indicated by second
address information that is included in the power
10 management event issued from the operating system, and
writing the read new firmware into the nonvolatile
memory device.

12. The information-processing apparatus according to
claim 10, wherein;

15 the first means includes means for reporting,
to the operating system, first address information
indicative of a storage location of an updating
information package that contains new firmware to
be written into the nonvolatile memory device and
20 an updating-process program used to write the new
firmware into the nonvolatile memory device; and

the second means includes means for calling for
the updating-process program contained in the updating
information package stored in a storage location that
25 is indicated by second address information included in
the power management event from the operating system,
thereby causing the updating-process program to execute

11. The information-processing apparatus according to
claim 10, wherein;

an updating process for writing the new firmware of the updating information package into the nonvolatile memory device.

13. An information-processing apparatus capable of
5 executing various types of programs, comprising:

a nonvolatile memory device configured to store
firmware;

firmware-updating means for updating the firmware
stored in the nonvolatile memory device; and

10 means for instructing, when updating the firmware,
the firmware-updating means to update the firmware,
using a power management event that is issued from
an operating system being executed in the information-
processing apparatus, the power management event
15 causing initiation and completion of a shutdown
process, then an updating of the firmware and lastly a
powering off or rebooting of the information processing
system.

14. The information processing apparatus as recited in
20 claim 13, wherein said shutdown process closes down all
active task including closing device drivers forming
part of said information processing apparatus.

15. The information processing apparatus as recited in
claim 14, wherein said information processing apparatus
25 includes a communication interface, a display
controller, a display and an I/O controller and said
shutdown process closes down said communication

100-160-9-100-100

interface, said display controller, said display and said I/O controller.

16. The information processing apparatus as recited in claim 15, wherein said information processing apparatus includes a central processing system, a main memory, a flash ROM, and power supply controller, and said shutdown process does not shut down said central processing system, said main memory, said flash ROM, and said power supply controller.

10 17. A firmware-updating method of updating firmware executed in an information-processing apparatus, comprising:

15 making an operating system execute a shutdown process, and issuing an instruction to update firmware stored in a nonvolatile memory device incorporated in the information-processing apparatus, after the operating system has completed the shutdown process; and

20 updating the firmware after the operating system has completed the shutdown process, in response to the instruction to update the firmware.

18. The firmware-updating method according to claim 17, wherein the issuing the instruction to update the firmware includes

25 issuing a shutdown request containing a request for updating the firmware, thereby making the operating system issue the instruction to update the firmware

after the operating system has completed the shutdown process.

19. The firmware-updating method according to claim 18, wherein;

5 the instruction to update the firmware is included in a power management event, which is issued from the operating system to power off or reboot the information-processing apparatus, when the operating system has completed the shutdown process; and

10 the updating includes
 powering off or rebooting the information-processing apparatus in accordance with the power management event, after the firmware has been updated.

20. The firmware-updating method according to claim 18, wherein;

15 the issuing the shutdown request includes
 reporting, to the operating system, first address information indicative of a storage location of new firmware to be written into the nonvolatile memory device; and

20 the updating includes
 reading the new firmware from a storage location indicated by second address information that is included in the instruction to update the firmware supplied from the operating system, and writing the read new firmware into the nonvolatile memory device.

25 The firmware-updating method according to

claim 18, wherein;

the issuing the shutdown request includes reporting, to the operating system, first address information indicative of a storage location of 5 updating information package that contains new firmware to be written into the nonvolatile memory device and an updating-process program used to write the new firmware into the nonvolatile memory device; and

the updating includes

10 calling for the updating-process program contained in the updating information package stored in a storage location that is indicated by second address information included in the instruction to update the firmware, thereby causing the updating-process program 15 to execute an updating process for writing the new firmware of the updating information package into the nonvolatile memory device.

22. A firmware-updating method of updating firmware executed in an information-processing apparatus,

20 comprising:

issuing, to an operating system, a shutdown request containing a request for updating the firmware stored in a nonvolatile memory device provided in the information-processing apparatus, thereby making the 25 operating system execute a shutdown process, and also causing the operating system to issue, after the operating system has completed the shutdown process,

A D D E D S * J E S D E D

100 ELEGANT DR

a power management event as an instruction to update the firmware and to power off or reboot the information-processing apparatus; and

5 executing a firmware-updating process to update the firmware into new firmware, in response to the power management event issued from the operating system when the operating system has completed the shutdown process, and then powering off or rebooting the information-processing apparatus.

10 23. A firmware-updating method of updating firmware executed in an information-processing apparatus, comprising:

15 issuing, from an application program executed on an operating system to the operating system, a shutdown request containing a request for updating firmware stored in a nonvolatile memory device provided in the information-processing apparatus;

20 activating a firmware-updating program operable without the operating system, in response to a power management event as an instruction to update the firmware and to power off or reboot the information-processing apparatus, which is issued from the operating system after the operating system has completed a shutdown process; and

25 powering off or rebooting the information-processing apparatus after the firmware is updated using the firmware-updating program.

24. A program stored in a storage medium and operable, when executed on a computer to cause said computer to execute a firmware-updating process for updating of firmware in the computer, said program causing said computer to perform the steps of:

5 receiving a firmware-updating request for updating the firmware, which is issued from an operating system when the operating system has executed a shutdown process on the computer; and

10 executing a firmware-updating process for updating, into new firmware, the firmware stored in a nonvolatile memory device provided in the computer, after the operating system has completed the shutdown process.

15 25. The program according to claim 24, wherein the firmware-updating request is included in a power management event issued, from the operating system when the operating system has completed the shutdown process, to power off or reboot the computer, and the program further operative to cause the computer to power off or reboot after completing the firmware-updating process.

2025165424284